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The Expenditure Impacts of London-based Individual Higher Education Institutions (HEIs) and their Students on the Economy of England: Homogeneity or Heterogeneity?

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Abstract

This paper replicates the analysis of Scottish HEIs in Hermannsson *et al* (2010a) to identify the impact of London-based HEIs on the English economy in order to provide a self-contained analysis that is readily accessible by those whose primary concern is with the regional impacts of London HEIs. When we treat each of the 38 London-based Higher Education Institutions (HEIs) that existed in England in 2006 as separate sectors in conventional input-output analysis, their expenditure impacts per unit of final demand appear rather homogenous (though less so than HEIs in Wales and Scotland), with the apparent heterogeneity of their overall impacts being primarily driven by scale. However, a disaggregation of their income by source reveals considerable variation in their dependence upon general public funding and their ability to draw in income/funding from external sources. Acknowledging the possible alternative uses of the public funding and deriving balanced expenditure multipliers reveals large differences in the net-expenditure impact of London HEIs upon the English economy, with the source of variation being the origin of income. Applying a novel treatment of student expenditure impacts, identifying the amount of exogenous spending per student, modifies the heterogeneity of the overall expenditure impacts. On balance this suggests that the impacts of impending budget cut-backs will be quite different by institution depending on their sensitivity to public funding. However, predicting the outcome of budget cutbacks at the margin is problematic for reasons that we identify.

Keywords: London Higher Education Institutions, Input-Output, England, Impact study, Multipliers, budget constraint.

JEL classifications: R51, R15, H75, I23.

1 Introduction

In this paper we analyse the expenditure impacts of London Higher Education Institutions (HEIs) on the English economy. The primary focus is on the expenditure impacts of individual HEIs and of their students, and the treatment of HEIs as a distinct sector of the economy. The paper, in effect, replicates the analysis of Hermannsson *et al* (2010a) for the impact of London HEIs on the economy of England. The main differences are in the tables, graphs and discussion of results. The rationale for this approach is to provide a convenient, readily accessible, self-contained analysis of the expenditure impacts of London HEIs in England for user groups whose primary interest is in English HEIs. Since we are also committed to producing similar analyses for Northern Ireland and for Wales, this is also an efficient way for us to generate a range of the regional-specific outputs of our research project on *The Overall Regional Impacts of HEIs* quickly.[1] Subsequent contributions will provide a fuller comparative regional analysis of HEI impacts.

There have been a number of studies of expenditure impacts of Scottish HEIs. These include Blake and McDowell (1967), Brownrigg (1973), Battu, *et al* (1998), Kelly *et al* (2004), Hermannsson *et al* (2010a). There have been rather fewer studies for other regional economies of the UK (e.g. Hill, 1997, for Wales). There have also been studies of sub-regional HEI impacts in England (e.g. Harris, 1997). The best of these studies have been input-output (IO) based (e.g. Kelly *et al*, 2004). We adopt an IO approach here but our analysis is

[1] The full details of the project are provided in the acknowledgements.

distinctive in two important ways. First, we provide a comprehensive, systematic and consistent IO attribution analysis of the impact of each individual HEI, as well as the impact of the London HEI sector as whole. This analysis highlights the heterogeneity of impacts across London HEIs. Second, the source of this diversity is not variation in the pattern of expenditure for individual HEIs, which would be the conventional argument. Rather it stems from the difference in the sources of funding across London HEIs.

In order to provide these close impact comparisons, we augment the IO table for England, the construction of which is described in Hermannsson *et al* (2010b), so that each individual London HEI is separately identified as a sector, with its own row and column. We then adopt an IO accounting approach and undertake various attribution analyses. While the results can be interpreted in terms of a conventional IO impact model, the approach does not require this and is not subject to the restrictive assumptions of IO modelling *per se*, though it continues to reflect the key distinction between exogenous and endogenous components of expenditures.

In comparing the impacts across London HEIs, we introduce a number of innovations. First, we acknowledge the importance of variation in the sources of revenues to HEIs, reflecting in particular the dependence of these HEIs on public funding. It proves instructive to explore the impact of HEIs taking into account the possible alternative uses of public expenditure.

In measuring the student expenditure impacts we draw on Hermannsson *et al* (2010c) in adopting a novel approach that emphasises the importance of the degree of exogeneity of student expenditure. We recognise the public funding of HEI students also has an opportunity cost. Again considerable heterogeneity is revealed across HEIs when we accommodate this.

The rest of the paper is structured as follows. In Section 2 we provide a brief overview of the London higher education system and present key characteristics of individual London HEIs – including their funding sources and the level of funding relative to the number of staff and students. In Section 3 we outline the HEI-disaggregated IO accounting approach, and present the results of applying it to HEIs' own expenditures. While total institutional expenditure impacts vary considerably across HEIs, we show that this largely reflects differences in the scale of HEIs. Once we control for scale, by focussing on the value of individual HEI multipliers, the results exhibit a striking degree of homogeneity given the variety and often highly specialised nature, of HEIs in London. We then show the impact of recognising alternative uses of the public funding of HEIs in Section 4. The resultant *balanced expenditure* HEI multipliers exhibit considerable heterogeneity.

We discuss the overall impacts of HEIs by incorporating the effects of student expenditures in Section 5. One key finding is that a focus on overall expenditure impacts gives a misleading impression of a homogenous HEI sector in London, which is in fact characterised by considerable heterogeneity once differences in funding sources are recognised. Against this background a simple

descriptive analysis suggests a number of "clusters" of less heterogeneous groups of HEIs within the sector as a whole, based upon alternative indicators of their impact on their host region. However, our results emphasise the critical dependence of any such clustering on the criteria on which any taxonomy is predicated and, in particular, on the precise definition of "impact". Of course, the analysis of this paper is confined to the *expenditure* effects of HEIs, whereas general taxonomies would naturally focus on a more comprehensive set of criteria (though these do not typically include estimated expenditure impacts).[2]

We present brief conclusions in Section 5, where we also consider the implications of our analysis for assessing the likely impact of the significant cut in public funding that HEIs are currently anticipating in the light of the recent emergency budget of the Liberal Democrat – Conservative coalition Government.

2. Key characteristics of London HEIs

There were 38 London Higher Education Institutions in 2006 and these are listed alphabetically in the first column of Table 1.[3] Also included in the table

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[2] See e.g. King (1970), Dolton and Makepeace (1982), Tight (1996) and Howells *et al* (2008) for typologies based on a wide range of HEI characteristics (some of which could be interpreted as proxies for expenditure effects).

[3] The University of London is a federal institution, with central functions listed as a separate institution in HESA accounts. The centre's incomes and expenditures were distributed among the member colleges *pro rata* in line with their income as revealed in HESA data. The Conservatoire of Dance and Drama is a network institution, which distributes income to partner colleges (which do not report to HESA). Therefore its expenditures in the HESA accounts do not reflect the actual expenditure structure of the entire institution. To correct for this we impose the average wage expenditure ratio as revealed by other London HEIs. The

is a sample of their more important characteristics, from the perspective of this impact study.

Table 1. Key characteristics of London HEIs

Institutions	Income		Employment		Students	
	Total	% Regional level funding	Income per staff	Share of wages in expenditure	Income per student £	Share non-English
Birkbeck	65	54%	67,391	66%	8,692	7%
Brunel	118	50%	61,804	62%	9,479	20%
ICR	63	28%	79,869	61%	359,548	40%
CSoSD	10	62%	113,212	48%	11,771	17%
City	136	24%	79,482	59%	10,350	28%
CD&D	12	81%	43,840	58%	11,690	34%
Courtauld	10	27%	90,595	52%	26,640	39%
East London	94	56%	76,465	52%	7,358	18%
Goldsmiths	59	58%	74,121	62%	9,539	22%
Greenwich	134	52%	83,381	47%	7,946	21%
Imperial	525	35%	90,091	56%	43,652	41%
IoE	64	47%	86,464	51%	21,320	21%
King's College	404	44%	87,880	61%	23,569	22%
Kingston	132	55%	79,244	59%	7,207	16%
University of the Arts	143	55%	70,238	55%	11,449	36%
LBS	87	10%	134,771	46%	54,483	69%
Metropolitan	151	58%	69,201	66%	7,089	26%
South Bank	113	42%	74,897	59%	7,605	17%
LSE	156	22%	86,407	52%	19,745	67%
LSHTM	66	29%	93,084	51%	73,846	57%
Middlesex	131	48%	77,326	55%	6,182	24%
Queen Mary	200	45%	72,782	60%	19,006	25%
Ravensbourne	11	74%	76,206	51%	9,495	16%
Roehampton	47	65%	49,820	66%	6,180	12%
Rose Bruford	6	75%	68,879	46%	8,515	22%
RAM	15	34%	80,225	55%	21,012	50%
RCA	25	60%	89,455	44%	29,834	45%
RCM	14	38%	92,300	54%	22,097	50%
Royal Holloway	92	45%	71,640	58%	13,247	31%
RVC	46	51%	81,012	55%	31,445	19%
St George's	71	50%	85,323	66%	28,278	11%
St Mary's	22	72%	58,553	63%	6,688	13%
SoOA	47	35%	66,155	62%	12,417	47%
SoPh	18	45%	80,997	55%	18,970	23%
Thames Valley	103	54%	53,535	69%	8,459	17%
Trinity Laban	15	50%	59,462	59%	19,339	36%
UCL	585	36%	82,782	61%	34,206	32%
Westminster	138	55%	75,935	56%	8,468	22%
Total/average	**4,130**	**43%**	**78,647**	**58%**	**14,259**	**25%**

Royal College of Nursing was omitted as there are severe anomalies in its income data as reported by HESA, which make it impossible to obtain an accurate picture of its income structure. This is unfortunate but should not change the overall analysis as the RCN is very small. It has 214 students or 0.07% of the London student population, but is slightly larger in terms of income – receiving approximately 0.19% of the income of the overall sector in London.

Column two shows the total income for the Higher Education sector in England in 2006 and how this was distributed among the individual institutions. Of the total income of £4,130 million, nearly 14.2% goes to the largest, UCL, 12.7% to Imperial and 9.8% to King's College. The income of London HEIs is around twice that of all Scottish HEIs and 4.6 times that of all Welsh HEIs. The distribution is, however, considerably less concentrated.[4] On this criterion, the largest institution is over 98 times the size of the smallest, Rose Bruford. This large variation in the size of individual institutions suggests that there is likely to be heterogeneity in other aspects of their operation. While such variation is also a characteristic of the Welsh and Scottish HEI sectors we would expect it to be more marked in London, where the concentration of population, and the nature of the city, allow significant degree of specialisation in HEI provision. The rest of the information in the table is standardised against the institution's income, number of staff or student population.

Column three gives the proportion of the total funding for each London HEI that comes from the government funding channelled through HEFCE. Note that while HEIs are heavily funded by the government, they are non-profit organisations and are not formally part of the public sector. On average 43% of London HEIs' funding comes from this source, significantly below the 54%, 58% and 65% that characterises the Scottish, Welsh and Northern Irish HEI sectors respectively (in 2006). However, as important for the present paper is

[4] In Wales, for example, 37% of total funding goes to the largest university, Cardiff, and 50% to the biggest two, Cardiff and Swansea. In Scotland funding is less concentrated, with the largest university, Edinburgh, accounting for just over 20% of the sector's income, and the top three, Edinburgh, Glasgow and Strathclyde, absorbing 45% of the total.

the variation around the 43% figure. There is a considerable range: LBS is an outlier, which receives only 10% of its total funding from public sources, LSE 22% and City 24% of public funding. Conservatoire for Dance and Drama (which should be regarded as an outlier that required special treatment) has maximum dependence on public funding among London HEIs, at 81%, with Rose Bruford, Ravensbourne, and St Mary's on 75%, 74% and 72% respectively. Over 25% of the London HEIs are less dependent on public funding than even the minimum dependence apparent in other regions (St Andrews, 37% in Scotland and, in Wales, Cardiff 50%), and few come near the maxima observed in other regions (Bell College 88%; RWCMD 80%, though both are outliers).

Column four presents the income per member of staff. In 2006 the total employment in London HEIs was 52.5 thousand, so that the income per member of staff averages at £78.6 thousand (27% and 25% respectively above the averages for Wales, £61.8 thousand, and Scotland, £62.5 thousand). The ranking of London HEIs by employment is very close to that by income, but there is some variation and this is reflected in variation in income per staff member across institutions. The institutions have values that range between the high of £134,771 thousand for LBS to £49.8 for Roehampton (if we ignore CD&D).[5]

[5] In Wales the figures are £71.1 thousand for Cardiff and £44.8 thousand for Trinity College, a very similar range to that found in Scotland if the outlier, University of Highlands and Islands, is ignored.

However, variation in the share of wages in total income presented in column five is more limited (though not as limited as in Scotland and Wales). The average figure for the sector as a whole is 58%, with a range from RCA on 44% to Thames on 69%. However, the share is slightly lower and more variable than in Scotland or Wales.[6] It is clear that across all London institutions wage payments make up a significant and relatively similar share of total HEI expenditure.

University income per student is given in column six of Table 1. It is important to note that this is the total income of the institution divided by the total number of students, measured in FTEs. For the London HEI sector as a whole, the average was £14.3 thousand, compared to £10.1 thousand for Wales and £12.8 thousand for Scotland (but the latter figure includes a significant outlier, SAC, that pushes up the average). However, the London figure is itself influenced by the specialist Institute of Cancer Research, which is a huge outlier on £359.5 thousand. However, even if we omit ICR there is a high degree of variation across institutions from £73,846 thousand for London School of Hygiene and Tropical Medicine to £6.2 thousand for Roehampton and Middlesex.[7][8]

Finally, column seven presents figures for the proportion of students that are non-English. On average 25% of all students in London HEIs come from outwith England, a smaller percentage than in Scotland, where 29% come from

[6] The share is 60% in Wales, 59% in Scotland, and varies very little among HEIs.
[7] In the Welsh (Scottish) case the figure varies between £14.6 (£21.3) thousand for Cardiff (Edinburgh) and £5.4 (£6.3) thousand for UW, Lampeter (Bell College).
[8] Of course, these HEIs have radically different specialisms and primary functions.

beyond the national boundaries, while the figure for Wales is 49%.[9] Of course, many of the students from England will come from outside of London, but we accommodate this in the larger expenditures of "home" students in this case. But again there are large differences across institutions. Given its nature it is not surprising that Birkbeck is an outlier, taking 93% of its students from England, whilst LBS and LSE take only 31% and 33% of their students from their home region.

The information given in Table 1 reflects the fact that HEIs actually perform a range of activities, covering teaching, research and knowledge exchange that can be funded in a variety of ways. There are systematic differences in the way in which different London HEIs operate and the weighting of the activities that they undertake. This is especially the case for the smaller and more specialised HEIs, but is also apparent amongst the more conventional London universities. We would expect this variation in activities to affect the expenditure impacts of individual London HEIs on the English economy. It is this proposition that we test in the remainder of the paper.

3. The impact of London HEIs' own expenditures: conventional IO impact analysis

Florax (1992) identified over 40 studies of the regional economic impact of HEI expenditure and much has been published since. McGregor *et al* (2006)

[9] Of course, the region in this case is comparatively very large, so that the definition of "home" students here will include many students who are incomers to the London region.

summarise the methods and findings of the main UK studies. Most of these studies, especially earlier ones, are based on Keynesian income-expenditure models (Brownrigg, 1973; Bleaney *et al*, 1992; Armstrong, 1993; Battu *et al.* . 1998) whilst a smaller number use straightforward or extended IO modelling (Blake and McDowell, 1967; Harris, 1997; Kelly *et al*, 2004). Our view is that the IO method does indeed provide a valuable framework for investigating the expenditure impacts of HEIs, and we pursue that approach here. However, we use IO as an accounting framework that we modify to acknowledge the possible alternative use of public funding within England.

Here we use IO to attribute economic activity in England to London HEIs, both individually and as a sector (Miller and Blair, 2009; Hermannsson *et al,* 2010a). The analysis is based upon IO tables derived for the English economy for the year 2004. However, extensive augmentation of the basic table is required to generate an updated English analytical table for 2006 that identifies each individual HEI in London as a separate sector. We provide details of this process in Hermannsson *et al* (2010b).[10]

The direct spending impact of universities is separated into two categories: the impacts of HEIs' own expenditures on intermediate inputs (including the wages

[10] Much of the supplementary data required are sourced from the Higher Education Statistics Agency (HESA). The chosen year of reference is 2005/2006 as this is the last year for which the necessary data were available. The procedure used to derive the HEI-disaggregated IO table can be broadly divided into two steps. First we "roll forward" the IO table to reflect changes in Gross Value Added (GVA) from 2004-2006. Then we create a row and column for each institution.

of their own staff) and the consumption expenditures of their students.[11] We begin with a brief account of conventional IO impact analysis. We then apply this analysis to these two expenditure streams.

3.1 Conventional IO analysis

Regional IO impact analyses are frequently used to capture the total spending effects of institutions, projects or events. These analyses include multiplier, or "knock-on", impacts of any expenditure injection, obtained by summing up subsequent internal feedbacks within the economy (for a review see Loveridge, 2004). This section briefly outlines the methods adopted by impact studies[12].

Regional demand-driven models, including IO, distinguish between two types of expenditures: exogenous and endogenous. Exogenous expenditures are independent of the level of economic activity within the host economy. In IO studies exports, government expenditure and investment are typically taken to be exogenous[13] On the other hand, endogenous expenditures are driven by the overall level of economic activity within the host economy. Specifically, demand for intermediate inputs and often household consumption demands are

[11] Some studies have included an additional category, namely HEI-generated tourism activity, but this is typically much less important. In any case there is no consistent database for tourism-induced activities across HEIs, otherwise it would be straightforward to extend our analysis to include them.

[12] For a more detailed account of the methodology of impact studies and regional multipliers see e.g.: Miller & Blair (2009), Armstrong & Taylor (2000).

[13] The distinction between endogenous and exogenous activity depends on the model and the application. In particular, what is exogenous and what is endogenous to the model does not have to correspond with what is 'inside' and what is 'outside' the region in spatial terms.

taken to be endogenous. Input-output analysis identifies a clear causal pathway from exogenous to endogenous expenditures.

These demand-driven models assume that the supply side of the regional economy is entirely passive. This can be motivated in two alternative ways. In the short and medium runs this requires general excess productive capacity and significant regional unemployment. In the long run, supply-side passivity holds where the supply of the primary inputs of labour and capital eventually becomes infinitely elastic, as migration and capital accumulation ultimately eliminate any short-run capacity constraints (McGregor *et al,* 1996)[14]. We do not believe that the economy of England (or London) can be accurately characterised by an entirely passive supply side, even over the longer-term. However, in the present paper we continue to apply an IO approach. The results can be regarded as reflecting the maximum potential stimulus to aggregate demand in the economy of England. Alternatively, the results can be regarded as simply reflecting an accounting attribution. A complete analysis of impacts on the English economy would necessitate an application of our CGE model of England to allow us to capture supply-side constraints.

The derivation of the demand-driven multipliers draws on this notion that exogenous expenditure determines endogenous activity. In the standard Leontief Input-Output approach the endogenous vector of final outputs, $\boldsymbol{q}$ is

[14] The legitimacy of either set of conditions is ultimately an empirical issue. For example, there may be some cases, such as that of the the island economy of Jersey, where the institutional framework restricts migration so that the supply side could not legitimately be regarded as passive over any time interval. See Learmonth *et al* (2007).

determined by the vector of final demands, $\boldsymbol{f}$, through the operation of the Leontief inverse multiplier matrix. This can be summarised as:

(1) $$\boldsymbol{q} = (\mathbf{1} - \boldsymbol{A})^{-1}\boldsymbol{f}$$

where $\mathbf{(1-A)^{-1}}$ is the Leontief inverse. This is identifying the additional demand for intermediate inputs and consumption goods that accompany the final demand.

The output multiplier for each sector is the change in total output for the economy as a whole resulting from a unit change in the final demand for that sector. It can be found as the sum of the entries in the relevant column of the Leontief inverse. This allows a convenient expression for the gross output q^i attributable to the final demands f_i for the output of sector i:

(2) $$\boldsymbol{q^i} = \boldsymbol{m_i f_i}$$

where m_i is the output multiplier for sector i.

Multipliers can be derived for a variety of activity outcomes, including employment, income, output or GDP. The Type-II multipliers used here are those conventionally reported in demand-driven IO impact studies. Type-II multipliers incorporate not only the increase in demand for intermediate inputs but also induced household consumption effects, generated by changes in wage income, as endogenous elements in the multiplier process. For further details see Miller and Blair (2009, Ch. 6) and Hermannsson *et al* (2010b).

3.2 Results of the conventional IO analysis applied to HEIs' own expenditures

Our IO table provides a useful accounting framework in which each HEI can be attributed with the total regional economic activity driven by its final demand. This impact effect is composed of both the final demand for the HEI's output and also the knock-on impacts on other sectors, generated through directly and indirectly linked intermediate demand and household consumption. One key strength of IO as an accounting framework is that it is consistent. When such an attribution exercise is carried out on a sector-by-sector basis, the sum of the impacts attributable to each sector's final demands equals the economy-wide total[15].

Table 2 and Figure 1 summarise conventional Type II IO-based impact estimates for London HEIs. These are obtained by applying equation 2 to each HEI treated as a separate sector in our HEI-disaggregated IO table.[16] This is to treat HEIs simply as a conventional business. The first column shows the income of each HEI in London in 2006, as in Table 1. Columns two, three and four give the total direct, indirect and induced (Type-II) impact of HEI spending on total English output, GDP and FTE employment respectively.

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[15] Moreover, the validity of this attribution method does not rest on the same strict assumptions as identified for IO modelling in Section 3.1. For example, CO_2 attribution analyses of the type associated with the carbon footprint is most rigorously calculated using IO tables.

[16] For each institution, the direct, indirect and induced effects are calculated using the final demand for their output of the particular institution. This is not the total income of the institution (which will incorporate some sales to local intermediate and household consumption demands).

The first point to note is that the expenditures of London HEIs, considered as a single production sector, have a major impact on: English gross output £10,617 million, 0.87% of the English total; GDP £5,691, 0.53%, and employment, 98,340, 0.55%.[17] Comparisons with other regions should, of course, be undertaken with care since we: are only considering the sub-set of English HEIs that are located in London; are dealing with a very large region (in which many "home" students are likely to be much more heterogeneous and possess many of the characteristics of "non-home" students in other regions).

[17] The output, GDP and employment impacts in Wales (Scotland) are as follows: £1,635 million, or 1.84% of the total (£4,060 million or 2.28% of the total); £944 million or 2.33% (£2,315 million or 2.63%); 24,900 full-time-equivalents or 2.12% (55,100 full-time-equivalents or 2.76% for Scotland)

Table 1. Conventional Type-II impacts of London HEIs in 2006[18]

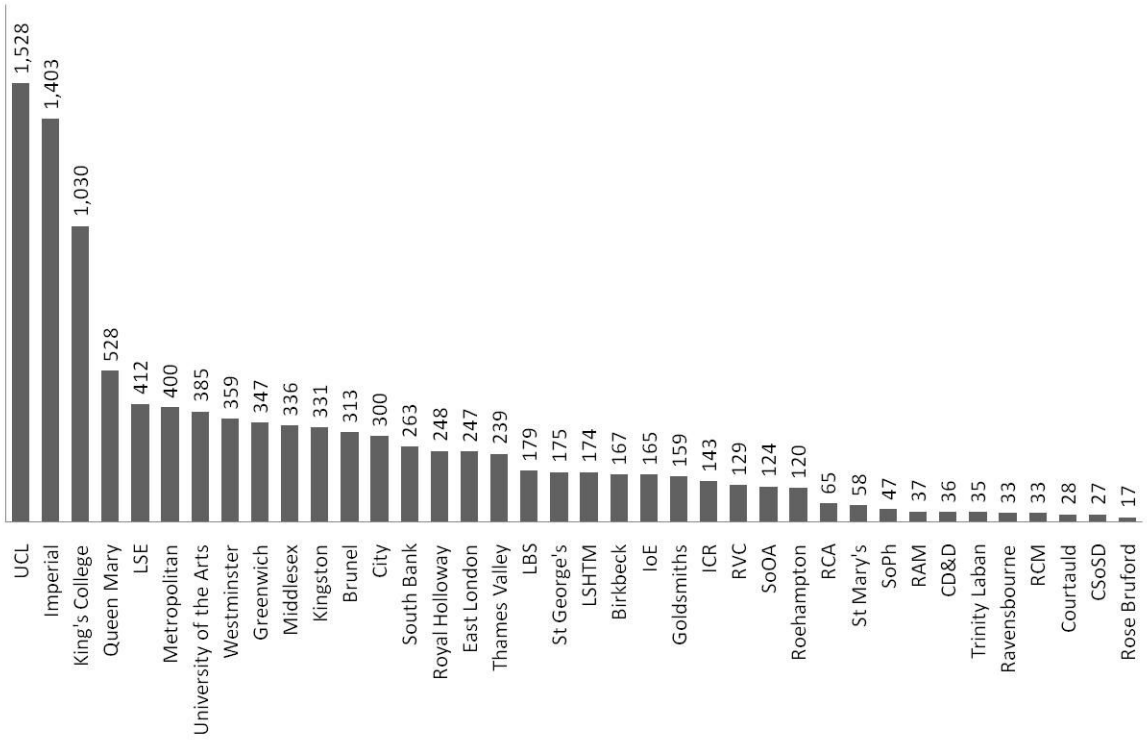
	Income	Output £m	GDP £m	Employment FTEs (000's)
Birkbeck	65	167	94	1,698
Brunel	118	313	172	3,246
ICR	63	143	78	1,303
CSoSD	10	27	13	336
City	136	300	161	2,719
CD&D	12	36	19	447
Courtauld	10	28	14	244
East London	94	247	127	2,276
Goldsmiths	59	159	88	1,570
Greenwich	134	347	172	3,037
Imperial	525	1,403	742	12,200
IoE	64	165	85	1,462
King's College	404	1,030	561	9,023
Kingston	132	331	178	3,046
University of the Arts	143	385	202	3,878
LBS	87	179	88	1,329
Metropolitan	151	400	225	4,096
South Bank	113	263	142	2,451
LSE	156	412	212	3,650
LSHTM	66	174	89	1,487
Middlesex	131	336	176	3,224
Queen Mary	200	528	286	5,059
Ravensbourne	11	33	17	308
Roehampton	47	120	68	1,381
Rose Bruford	6	17	8	162
RAM	15	37	19	341
RCA	25	65	32	565
RCM	14	33	17	282
Royal Holloway	92	248	133	2,382
RVC	46	129	68	1,166
St George's	71	175	99	1,557
St Mary's	22	58	32	635
SoOA	47	124	68	1,243
SoPh	18	47	24	421
Thames Valley	103	239	137	2,646
Trinity Laban	15	35	19	366
UCL	585	1,528	836	13,727
Westminster	138	359	190	3,378
Total	**4,130**	**10,617**	**5,691**	**98,340**
% of ENG total output/GDP/employment		**0.87%**	**0.53%**	**0.55%**

The second point is that there is considerable variation in the impacts of individual HEIs, as simple inspection of Figure 1 makes clear. However, these are clearly strongly

18 The sum of the impact of individual institutions presented in Table 2 reveals a slightly larger impact (0.2%) than when estimated based on a single aggregate London HEIs sector as done in Hermannsson et al (2010d). This is discrepancy is due to rounding issues in the computation.

affected by the initial scale of the individual institutions. A natural way of eliminating scale effects in an IO impact analysis is to focus on the *multiplier* values associated with a unit change in the final demands for each HEI's output. These are the m_is in equation 2, in this case relating to each of the 38 HEI sectors of the HEI-disaggregated IO table. Their values are shown in Figure 2.

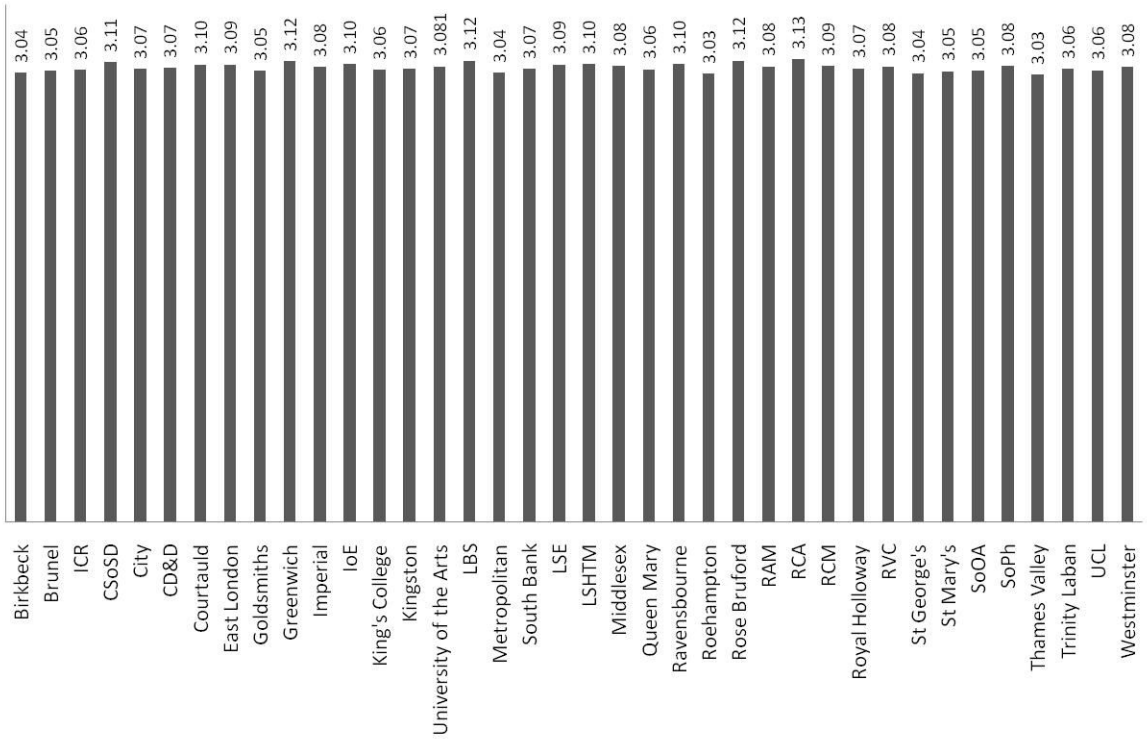
Figure 1 Output impact (Type-II) of London HEIs expenditures, £m



The most striking thing about the multiplier values in Figure 2 is their comparative uniformity, and their high values relative to those for Scottish and Welsh HEIs. The mean Type II multiplier for London HEIs is 3.13, whereas it is just over 2 for Scotland and Wales. The lowest conventional Type II output multiplier in the London case is 3.03, associated with Roehampton and Thames Valley University, which is 97% of the highest, 3.13 for the Royal College of

Art.[19] The results appear to suggest that London HEIs are rather homogeneous in terms of the intensity of the impact of their expenditures on the English economy. In essence this reflects the similarity of the cost structure of different London institutions, which was indicated in Table 1 by the similarity of the share of wages in total income across London institutions.

Figure 2 Conventional Type-II output multipliers for London HEIs



4. The alternative uses of public funds

We show in Hermannsson *et al* (2010d), that allowance for alternative uses of public funding of London HEIs has an important impact on estimates of the

[19] The corresponding values for Wales (Scotland) are: RWCMD (Bell College) 1.97 (2.05), which is 97% (95%) of the highest; 2.03 (2.16), associated with Cardiff and NEWIHE (Edinburgh) and the coefficient of variation is only 0.007 (0.012)).

expenditure effects of the HEI sector as a whole. The issue is that in so far as the government expenditure on HEIs displaces other public expenditure in England, this is important for assessing regional impacts. Here we extend this analysis to individual institutions and show that the effect of public funding varies significantly among London HEIs. This means that HEIs that appear to have similar conventional expenditure impacts have rather more distinctive impacts once alternative uses of public funds are accounted for. Attention is now focussed on the impact that HEIs exert beyond that of general government expenditure.

The Input-Output framework, combined with detailed information about the income sources of each HEI, enables a disaggregation of HEIs' impacts in terms of the origin of the exogenous final demands. This allows an analysis of the extent to which the impacts attributed to HEIs under a traditional IO approach would instead now be attributed to general government expenditure.

In order explicitly to acknowledge the opportunity cost of public expenditure and therefore switching effects, we deduct the impacts of the government funding from the overall expenditure impact of each London HEI. The key here is the proportion of the HEI's income identified in Table 1 as coming from the government. The direct expenditure on the output of each London HEI, i, is therefore divided into government funding (bf_i) (reflecting the fact that for devolved regions these come through the operation of the Barnett formula), which comes through HEFCE, and other funding (of_i) which includes all other

sources of funds such as exports to the rest of the UK and the rest of the World. The conventional attribution to an individual HEI is simply:

(3) $$q^i = (bf_i + of_i)m_i$$

where bf_i+of_i = f_i. For Type-II output attribution, these are the values reported in column 2 of Table 2 and plotted in Figure 1.

The adjusted, or "balanced expenditure", attribution subtracts the publicly funded element of each HEI's funds (channelled through HEFCE) and the associated own-multiplier effects. This is calculated as $bf_i m^p$, where m^p is the Type-II multiplier for the aggregated public sector (and so is invariant across HEIs).[20] The balanced expenditure aattribution, q^{iB} is therefore given by equation 4.

(4)

$$q^{iB} = (bf_i + of_i)m_i - bf_i m^P = of_i m_i + bf_i(m_i - m^P)$$

To summarise, the output impact of an individual HEI *net* of its government funding equals the sum of the output impact attributable to other funding sources $of_i m_i$ and the impact of switching from general public expenditure to HEIs, $bf_i(m_i - m^p)$. This latter term is positive if the individual HEI multiplier, m_i, is greater than the aggregate public sector multiplier, m^p, and negative if it

[20] m^p is the weighted sum of the sectoral multiplier values, where the weights are the shares of total public sector expenditure in that sector. Therefore $m^p = \sum \alpha^p_i m_i$ where $\alpha^p_i = f^p_i / \sum f^p_i$.

is not. Dividing equation (4) through by total final demand for the ith HEI, bf_i+of_i, yields a "balanced expenditure" multiplier, m^B_i, given by:

(5) $$m_i^B = (1 - \alpha_i)m_i + \alpha_i(m_i - m^P) = m_i - \alpha_i m^P$$

where α_i is the share of government expenditure in HEI i's total final demand.

The balanced expenditure multiplier shows the impact of a £1 increase in final demand (with a constant composition) for HEI i. This multiplier value takes into account he fact that a portion of final demand will be switched from general public expenditure. The balanced expenditure multiplier is a weighted average of the individual HEI's multiplier and the switching multiplier (m_i – m^p*)*. The weights are the proportions of government and other funding in the HEI's total final demand. The intuition is clear: switching public expenditure to the HEI has no effect on the impact attributed to the HEI's other funding sources, which continue to exert the expected impact (m_i), weighted by the share of other funds ($1-\alpha_i$). The public expenditure that is switched has a multiplier value whose sign and scale is determined by the difference between the HEI's own multiplier and the aggregate public sector multiplier (m_i – m^p*),* and this is weighted by the share of public expenditure in total final demand for this HEI's output, α_i.

This discussion suggests that an extreme "policy scepticism" perspective implicitly assumes that α_i = 1 and (m_i – m^p) = 0. However, no London HEI is funded 100% by the government, so that for all institutions $\alpha_i < 1$. However,

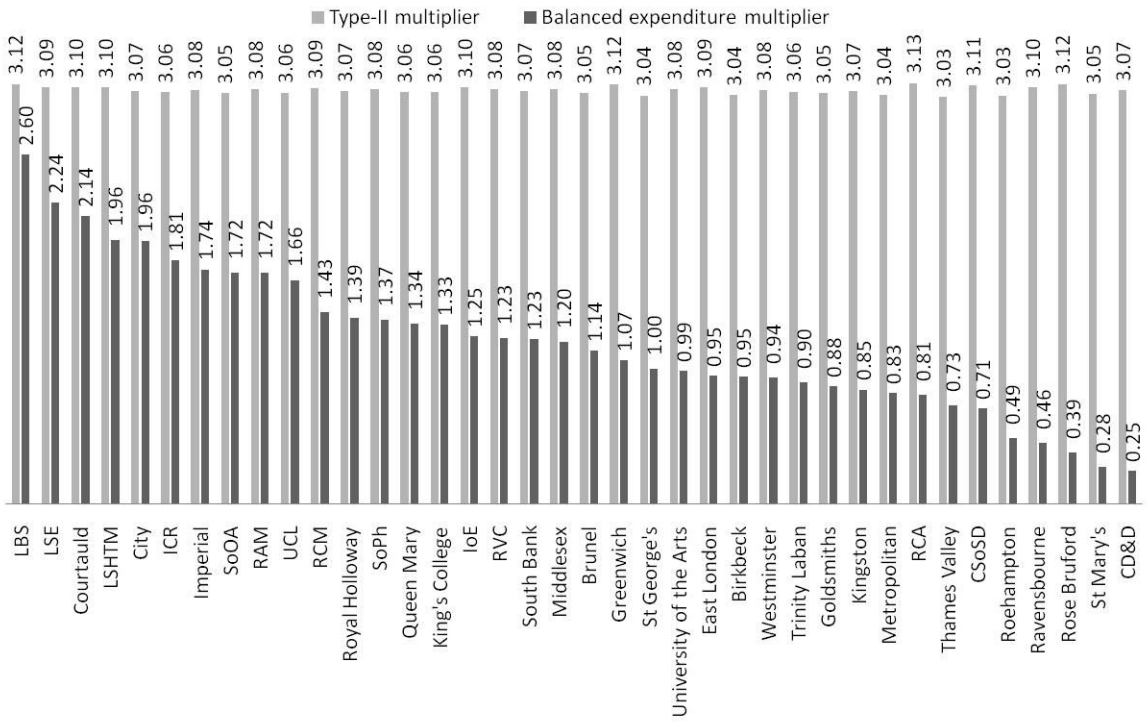
the switching multiplier for the London-based HEIs in England is negative, in contrast to other regions, so that $m_i - m^p < 0$.

Accounting for the possibility of alternative uses of public funding is potentially very important. Firstly, m^B_i must be less than m_i if the HEI receives any public funding at all. Traditional impact studies neglect the possible alternative use of public expenditure and so might be regarded as exaggerating the net impact of HEIs on their host regional economies where public funding of HEIs is significant. Secondly, in principle, even the sign of m^B_i cannot be determined *a priori*. If an HEI is heavily dependent on constrained public funding and the HEI's own multiplier is smaller than the general public expenditure multiplier (as is the case in England), its balanced expenditure multiplier might be negative.

The balanced expenditure multipliers for all London HEIs are shown in Figure 3, together with their conventional IO counterparts. All of the balanced expenditure Type-II multipliers are positive but lower than their corresponding conventional values. All London HEIs receive significant levels of government funding, and netting out the impact of this funding inevitably reduces the measured impact of HEIs' expenditures. However, HEIs as a whole are relatively export-intensive, and draw a significant portion of their funds from sources of final demand outwith England. However, HEIs' expenditures are, on average, more import-intensive than those of the public sector. Accordingly, London HEIs exert negative expenditure effects relative to the public sector. The opportunity for alternative uses of public funds certainly does not imply

negligible (or in the limit zero) expenditure impacts as is often implied by the "policy scepticism" perspective, though it does imply lower expenditure impacts attributable to HEIs *per se* than conventional IO impact studies imply.

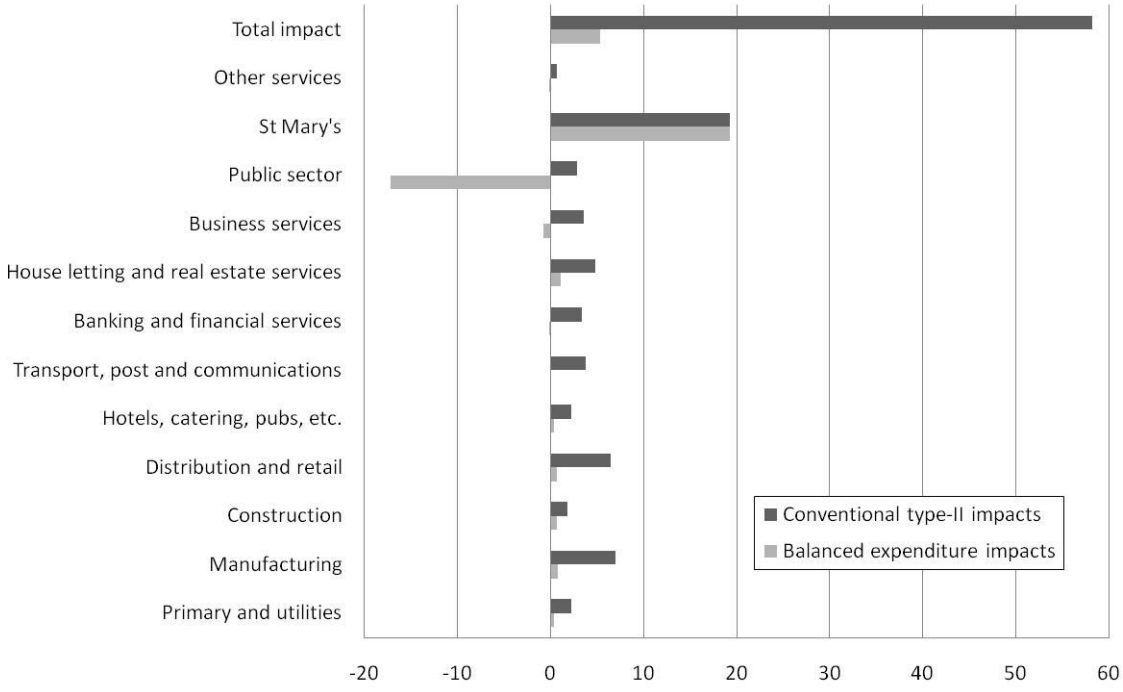
Figure 3 Balanced expenditure multipliers for London HEIs



The detailed operation of the balanced expenditure multiplier, as against the conventional multiplier, can be seen in Figure 4 for the case of St Mary's. The conventional Type-II impact output attribution to St Mary's is £58.2 million (as indicated in the top horizontal dark bar in Figure 4). The sectoral impacts are graphed in the lower part of figure and all are positive since these are conventional IO results. However, the lighter bars illustrate the (Type-II) balanced expenditure output effects. Figure 4 shows the balanced expenditure impacts as the net outcome of an expansion due to the stimulus to total final demand together with a contraction due to the notional reduction in government

expenditure that is required to reflect the government expenditure switching. There is a big negative impact on the public sector and small negative impacts on the Business and the Banking and Financial Service sectors. Overall, the total output attributed to St Mary's under the balanced expenditure scenario is only £5.3 million.

Figure 4. Traditional and balanced budget output impacts of St Mary's disaggregated by sector (£m)



A key feature of the results presented in Figure 3 is that there is considerable variation in the balanced expenditure multipliers across HEIs in London. The minimum value of the multiplier is 0.28 for St Mary's, less than 10% of the value of its corresponding Type II multiplier (3.05), and the maximum value is 2.60 for LBS, 83% of its conventional multiplier (3.12). The mean value of the balanced expenditure multipliers for London HEIs is 1.21, which is 39% of the

mean of their Type II multipliers (3.07).[21] Recall that, for conventional Type II multipliers, the smallest value was 97% of the largest among the London HEIs: for the balanced budget multipliers the comparable figure is 11%. The range of multiplier values has increased significantly, as has the coefficient of variation, which for London (Wales; Scotland) is some 56 (44, 28) times as great, 0.45 as against 0.008, (0.33 as against 0.007; 0.32 as against 0.012), relative to the conventional IO multipliers. The increase in variability in shifting from conventional IO to balanced expenditure multipliers is greatest in London.

It is apparent from equation (4) that the proportion of HEIs' funding coming from the public sector is going to have a major impact on an HEI's balanced expenditure multiplier. We already know that there is limited variation in HEIs own expenditure multiplier (m_i) and the aggregate public expenditure multiplier (m^p) is invariant across HEIs, so the main source of variation is in the size of the term $-\alpha_i m^p$ which is directly related to the share of government funding in total final demand for the HEI (α_i). Figure 5 plots each HEI's balanced expenditure multiplier, expressed as a percentage of its type II IO output multiplier, against the percentage of its funds that are publicly provided. Not surprisingly there is a strong negative relationship between the two series (correlation coefficient of -0.999 higher than the -0.965 for Wales and -0.998 for Scotland).

[21] In Wales the minimum value of this multiplier is 0.31 for RWCMD (which is only 15.7% of its conventional IO multiplier value) and the maximum value is 0.84 for UW Swansea (42% of its conventional multiplier value). In Scotland the range is rather greater than in Wales, with Bell College having the lowest balanced expenditure multiplier (0.28, 14% of the type II multiplier value), and St Andrews the highest (1.35, 64% of the conventional multiplier value).

Simple inspection of Figure 5 suggests that there are seven possible London HEI groupings on this criterion and two outliers. First, LBS is an outlier, retaining 83.2% of its conventional Type II multiplier. There is then nearly an 11 percentage point drop to LSE, which retains 72.4% of its conventional output multiplier. Courtauld also retains over 69% of its conventional IO impact, and together they form a second group (though this is a small and specialist HEI). There is then a less marked drop, but still of over 5 percentage points, to the next grouping of HEIs, led by City, whose balanced expenditure multiplier is 63.8% of its Type II IO multiplier, and certainly includes London School of Hygene and Tropical Medicine (63.3%). While there is only a 4 percentage point gap to ICR (59.2%), this could be argued to be the start of the third group (of more than one HEI). The group includes Imperial (56.6%), School of Oriental and African Studies (56.4%), Royal Academy of Music (55.8%) and UCL (54.4%), all of which retain well over 50% of the value of their conventional multiplier.

There is then an 8 percentage point drop to the fourth group of HEIs, led by the Royal College of Music (46.3%). The group contains all those HEIs who retain at least 43.5% of the conventional IO multiplier, and ends with King's College (43.5%).[22] There is then a less marked drop of 3.3 percentage points to the fifth group led by the Institute of Education (40.2%) and finishing with Brunel (37.3%).[23]

[22] The fourth group comprises: RCM (50.7%), Royal Holloway (45.2%), School of Pharmacy (44.5%), Queen Mary (43.8%) and King's College (43.5.2%).
[23] The fifth group comprises IOE (44.6%), South Bank (40.0%), Royal Veterinary College (40.0%), Middlesex (39.0%) and Brunel (37.3%)

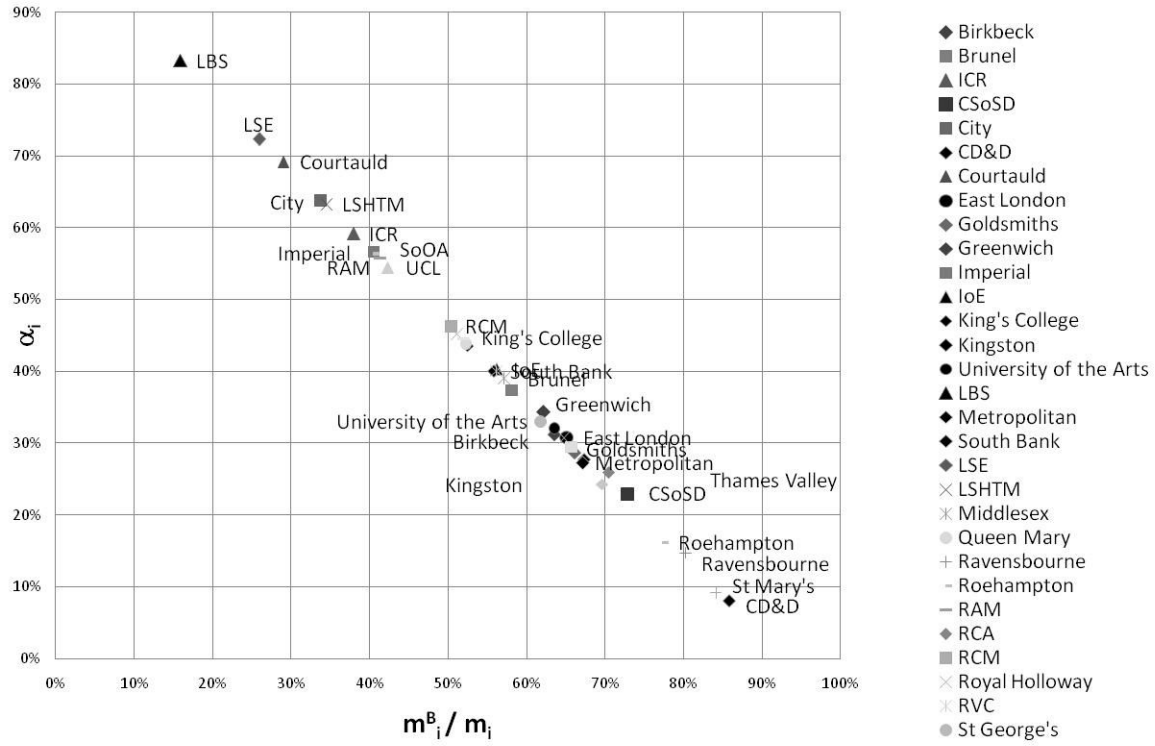
There is then a gap of only 3 percentage points to the sixth and largest group, led by Greenwich (34.3%) and extending to CSoSD (22.9%). A distinction could be made between those who retain over 30% and more of the value of their conventional IO multiplier and those who retain over 20%, but the distinction would rest on only a 1.2 percentage point drop from Westminster (30.7%) to Trinity Laban (29.5%), so we suggest treating this as a single, larger group of HEIs.[24]

A substantial drop of 6.8 percentage points marks the gap to the seventh group consisting of Roehampton (16.1%), Ravensbourne (14.7%), Rose Bruford (12.4%) and. Finally, St Mary's and CD&D are outliers retaining 9.2% and 8.0% respectively of their Type II multiplier values. Of course, there may be some dispute about the precise composition of each group (especially in circumstances where the discrete jump between groups is modest in scale), and recall that here we are focussing solely on the expenditure impacts of HEIs. Furthermore, Royal Academy of Music seems to retain a larger share of their Type II "bang per buck" than their share of public funding suggests.

On average London HEIs' balanced expenditure multipliers are around 48% of their Type II multipliers, higher than Scotland (40%), which is in turn higher than Wales.

[24] The sixth group includes Greenwich (34.3%), St George's (33.1%), University of the Arts (32.1%), Birkbeck (31.2%), East London (30.8%), Westminster (30.7%), Trinity Laban (29.5%), Goldsmiths (28.7%), Kingston (27.8%), Metropolitan (27.2%), RCA (25.9%), Thames Valley (24.3%) and CSoSD (22.9%)

Figure 5 Balanced expenditure multipliers (as % of type II output multiplier) against public funding as a percentage of total final demand for the HEI.



5. The overall impact of HEIs' and their students' expenditures

Conventional IO impact analyses of student expenditures typically adopt one of two quite different approaches. They either treat all HEI students' expenditures as additional expenditure within the host region (Harris, 1997) or only consider the expenditures of students who move into the region to study as additional (Kelly *et al*, 2004). Our view is that these alternative perspectives are effectively approximations to, and special cases of, an IO accounting approach in which the key distinction is between those expenditures (or parts of expenditures) that are exogenous and those that are endogenous. Hermannsson *et al* (2010c) implement this approach for Scotland using the survey by

Warhurst *et al* (2009), combined with the database employed in our preceding analysis. Here we implement the approach using a survey of the expenditures of students attending English HEIs by Johnson *et al* (2009). By analogy with the discussion in Section 4 above, we can distinguish between the government funding of students and other student funding and engage in a similar attribution analysis that identifies balanced expenditure multipliers for students' expenditures.

Here we wish to provide an overall analysis of HEI impacts by adding student expenditure impacts to those of the HEIs' own expenditures as discussed in Sections 3 and 4. This implies that for each £1 million of HEI final demand expenditure we calculate the associated student numbers and the impact on the local economy that occurs from those students' exogenous consumption.[25] The exogenous expenditure per student does vary between students of different types. To accommodate this we use an equation of the following form:

(6) $$m_i^s = \frac{m^C s_i}{f_i} \sum_n \gamma_{i,n} c_n x_n$$

where m^S_i is the student consumption multiplier, m^C is the standard consumption multiplier, s_i is the number of students in HEI i and there are n student types. $\gamma_{i,n}$ is the proportion of the students in HEI i in type n, c_n is the average consumption from student group n and x_n is the proportion of the income of group n that is exogenous. In the present application we have three

[25] In order to determine exogenous consumption we subtract student consumption financed from wages and intra-family transfers. Also, where appropriate, we adjust for maintenance grants from the Welsh Assembly Government.

groups: English students, students from the rest of the UK and students from the rest of the world.

Figure 6 Aggregate multipliers of London HEIs ($M^{A}i$) the darker area shows the institutional component (the standard IO multiplier M_i) while the lighter shaded area shows the student consumption component (M^{S}_i)

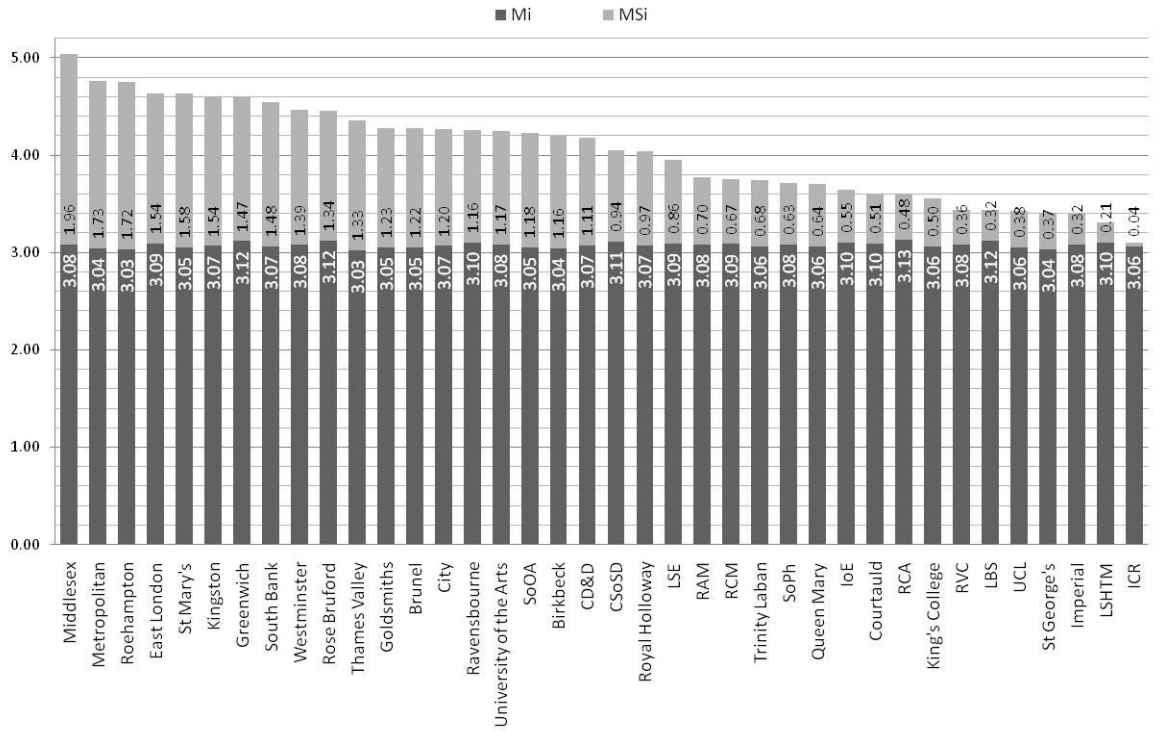


Figure 6 gives the conventional Type II student consumption multiplier value where the associated output is expressed as a proportion of HEI expenditure. These are conventional multiplier values in that they do not include any adjustment for public sector expenditure switching. For each HEI, this figure has been added to the conventional Type II HEI output multiplier value shown in Figure 2. Note that the associated student consumption multipliers vary widely across HEIs, from 1.56 for Middlesex (46.3% of the institutional expenditure multiplier), to 0.03 for Institute of Cancer Research, clearly an

outlier, reflecting its highly specialist focus and functions. In contrast in Scotland the range of values is much lower, from 0.07 for Scottish Agricultural College (SAC) to 0.92 for Queen Margaret University College (QMUC). At a maximum, the conventional student multipliers only make up 30% of the conventional total Type II impact. In Scotland the student multiplier values are always dwarfed by the conventional multipliers for HEIs own expenditure, but the London-based HEIs appear different in this respect (though the contrast with Welsh HEIs is even greater). London HEIs appear to represent an intermediate case, where student impacts are significant, but do not dominate total impacts.

Figure 7 Aggregate balanced expenditure multipliers of London HEIs (M^{AB}_i). [The darker area shows the institutional component (M^{B}_i) while the lighter shaded area shows the student consumption component (M^{BS}_i).]

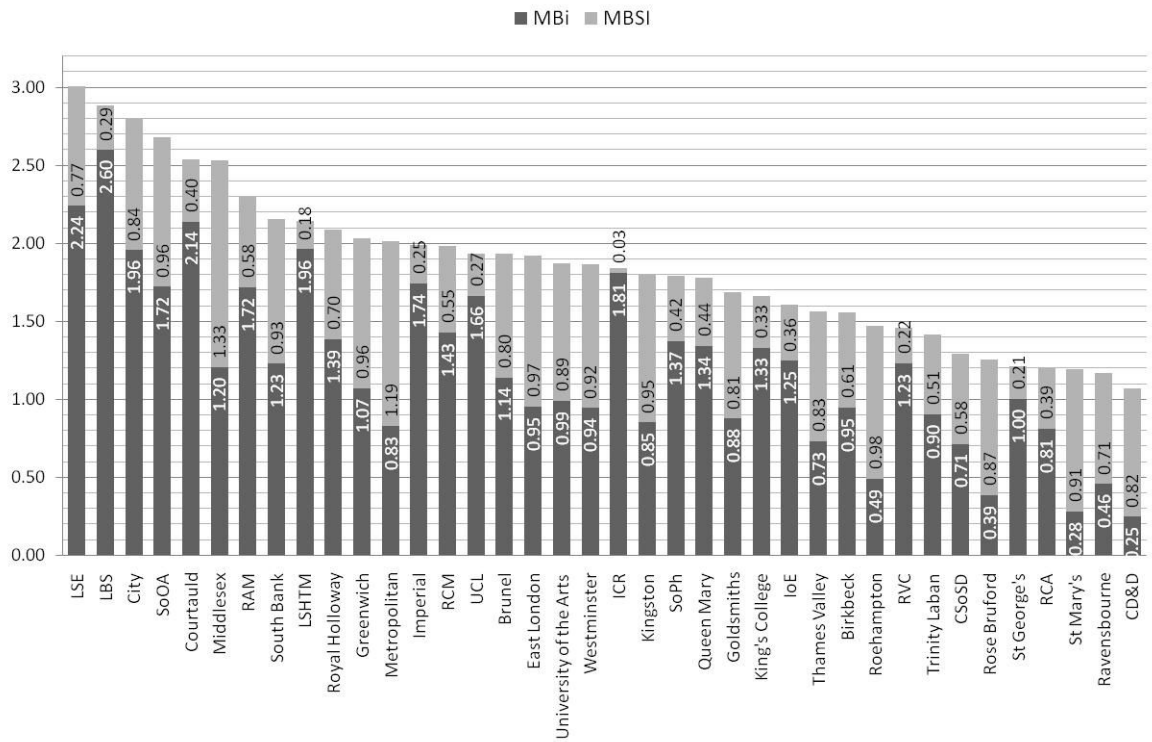


Figure 7 shows the total balanced expenditure multiplier values for each London HEI. That is to say, the student multiplier value is also adjusted to take into account reduced public expenditure elsewhere in England as a result of maintenance grants from the government. This multiplier is then added to the HEI balanced expenditure values given in Figure 3. Taking into account public sector expenditure switching implies a downward adjustment to the student consumption multiplier. However this downward adjustment is in general small relative to the adjustment to the HEI expenditure multiplier. This has two implications. First, for some institutions, student consumption makes up a large share of their total balanced expenditure multiplier. So for Metropolitan, the student expenditure accounts for 51% of the total impact, but for London School of Hygiene and Tropical Medicine it accounts for only 8.4%.[26] Second, the combined impact of HEI and student expenditure means that for all institutions the multiplier value is greater than unity. Indeed for LSE it is in excess of 3.0 and a further 11 HEIs have a multiplier in excess of 2.0 (well above those for Scotland and Wales). Third, the addition of student spending leads to a marked change in the ordering of HEI's by their balanced budget multiplier values. Also there are no longer clear groupings amongst institutions, although high and low outliers still remain. Finally, the multiplier values reflect the wide range of activities undertaken by different HEIs. For example,

[26] In Wales the student impacts are much more significant. Indeed 74% of SIHA's balanced expenditure multiplier is attributable to student expenditure, whereas the maximum value in Scotland is 60% (Bell College), and for only four Welsh HEIs is the contribution less than 50% (Trinity UC, 48%; UW, Swansea, 42%; UW, Bangor, 40%; and Cardiff 39%). In the Scottish case, the contribution of students is typically significantly lower. For Bell College, QMUC and Edinburgh College of Art (ECA) more than half (60%, 54% and 52% respectively) of the total balanced expenditure multiplier is contributed by student expenditures, and Napier, Caledonian and Paisley are just less than 50%.

Imperial and Metropolitan have similar balanced expenditure multiplier values but their decomposition into university and student expenditure effects are quite different.

6. Conclusions

In this paper we explore the expenditure impacts of London HEIs and their students on the economy of England by applying an IO attribution analysis to a purpose-built, HEI-disaggregated English IO table. Using a conventional IO analysis the level of HEIs' own expenditure impacts on GDP vary considerably from the £1,528 million contributed by UCL to the £17 million impact of Rose Bruford. However, when expenditure effects are corrected for scale and expressed in terms of conventional multipliers, HEI impacts appear comparatively invariant across HEIs in London.

These results contrast with a growing "policy scepticism" that regards HEI expenditure impacts as negligible or even zero, on the grounds that public funds allocated to HEIs could, in principle at least, be reallocated to other uses which would also have "knock on" effects of a comparable scale. We investigate this hypothesis by conducting simulations in which we subtract from the overall HEI impact the effect that its public funding would have if it was used instead to expand the public sector. The resultant *balanced expenditure* multipliers are all positive, denying the policy scepticism hypothesis, but are considerably smaller than conventional IO impacts. The balanced expenditure multipliers also exhibit considerable heterogeneity, reflecting to a large degree the

different extents to which individual HEIs obtain their funding from the government (via HEFCE). If these impacts are used in a simple descriptive way to categorise HEIs, there appear to be probably seven groups of London HEIs, and several outliers.

We adopt a new method of attributing impacts to the expenditure of HEIs' students, a method which accommodates earlier treatments as special cases. In fact, these impacts vary very substantially across HEIs, reflecting the student intensity of the institution and the geographical source of the student body. Incorporation of these effects within aggregate/ composite (institutional and student) conventional IO and balanced expenditure multipliers, tends to reduce slightly the degree of heterogeneity among HEIs in terms of aggregate expenditure impacts at least (and has the impact of improving the estimated impacts of the post 1992 universities). For London the student expenditure impacts rather more important than they are for Scotland, but less important than they are for Wales.

Overall, our analysis implies a more complex and subtle view of the expenditure impacts of HEIs than is traditionally associated with impact studies of the sector. Crude IO estimates of impact suggest a homogeneity that we think is misleading, and our formal modelling of HEI impacts is more in accord with the sector's intuition about the nature of London HEIs. It is important to note that our analysis overwhelmingly rejects the "policy scepticism" perspective, at least in its limiting form: HEI expenditure impacts are important, but their

measurement should acknowledge the possible alternative uses of public expenditure within the host region.

Our approach is capable of extension in a number of directions. Most obviously we can apply our analysis to the other regions of the UK, which are subject to a public expenditure constraint through Barnett.[27] Such an extension allows us to make systematic comparisons across both regions and HEIs. Secondly, the lessons of the analysis are not restricted to HEIs, but are applicable to any impact analysis relating to devolved regions where final demands are at least partially publicly funded.

A third extension to a Social Accounting Matrix (SAM) approach holds the promise of further enriching the analysis of the expenditure impacts of HEIs, through the more explicit treatment of financing issues that this would facilitate.[28] Fourthly, HEI impact studies have focussed to date exclusively on impacts that occur within the boundaries of the host region. It may appear understandable that these impacts would attract most attention from the devolved administrations. However, HEIs in the UK are part of an integrated higher education system. Furthermore, the regions in which HEIs are located are part of an inextricably intertwined system of interdependent regions linked by migration, trade flows and wage bargaining mechanisms. It is therefore inevitable that HEIs will exert impacts that extend well beyond the geographic

[27] See e.g. Hermannsson et al (2010a,e,f) for the cases of Scotland, Wales and Northern Ireland respectively.
[28] Allan *et al* (2010) show how a SAM-based analysis of the impact of a renewable energy project yields allows an appropriate and much fuller analysis of the impact of community benefits and community ownership than conventional IO can capture.

boundaries of their host regions. These effects should at the very least be of interest to UK government. Some of these impacts are likely to be positive, as is probably the case, for example, for the movement of graduates to London and the South East from the peripheral regions. Certainly, interregional extensions of our analysis should enhance our understanding of the regional impacts of HEIs, and this knowledge may be of wider interest than is immediately apparent. More generally, greater understanding of the impacts of HEIs will provide a more convincing evidence base for assessing the likely impacts of any contractions in public expenditure, a point we return to shortly.

Furthermore, this study is concerned exclusively with the expenditure, or demand-side, impacts of HEIs. But these are not the only, and are probably not the most important, impacts that HEIs may have on their host regional economies. For example, one of the most important contributions that HEIs can make to their host regions, at least in principle, is their supply of skilled graduates whose (private) benefits are apparent through graduate wage premia. However, recall that in expenditure impact analyses, including our own, in-coming students' expenditures typically have the biggest impact, yet these may be the very students who are least likely to stay and stimulate the host region through their enhanced productivity. Any overall assessment of the contribution of HEIs to their host region must attempt to measure supply-side, as well as demand-side or expenditure impacts. Our view is that regional Computable General Equilibrium (CGE) models can be usefully applied to explore the supply-side impacts of HEIs. For example, in Hermannsson *et al* (2010g) we simulate the impact of maintaining current policies on the level of student

recruitment. The resultant increase in the proportion of graduates in the Scottish labour market has an impact which dominates the expenditure effects of Scottish HEIs.

There are other potentially beneficial supply side impacts occurring through channels such as innovation and knowledge exchange (e.g. Harris and Moffat, 2010a,b), and through externalities, for example through health (both generally through exposure to higher education and through the research of HEI medical schools) (e.g. McMahon, 2004, 2009), and again CGE analyses rooted in micro-econometric evidence are likely to be revealing. However, while much certainly remains to be done in terms of enhancing our understanding of the supply-side impacts of HEIs, it would, in our view, be a mistake to assume that the more subtle aspects of the demand-side impacts of HEIs are already well-understood.

We end on a cautionary note, which reflects the absence of a detailed model of individual HEI behaviour in our present analysis (or indeed in our CGE analyses, which tend to focus on the HEI sector as a whole). While our approach does of course, *inter alia*, identify those HEIs whose activity is currently most dependent on public funding, we would caution against its mechanical use to project the likely impacts of impending government expenditure cuts, since this is going to be critically dependent on the reactions of individual HEIs. These reactions are themselves likely to be characterised by heterogeneity, reflecting varying objectives and differing opportunities and constraints. Naturally, given the recent (July 2010) emergency budget of the Liberal Democrat – Conservative coalition Government, there is considerable

interest in what is likely to be a major cut in the public sector budget of HEIs. The crucial issue is not the conventional HEI expenditure multiplier, which we know is comparatively uniform across HEIs from our analysis. While balanced expenditure multipliers provide a better idea of sensitivity to government funding, application to marginal changes is problematic. What is critical here is the reactions of individual HEIs to significant and probably unprecedented public funding cuts and attempting to capture this would require us to go beyond the present accounting/ attribution exercise to consider the impact of major changes in government expenditure at the margin. An HEI-disaggregated regional CGE approach would certainly provide a preferable starting point for analysing changes at the margin (since it is not predicated upon an entirely passive supply side), but no matter how sophisticated the model of the host regional economy, what is likely to be crucial here is characterising the behaviour of individual HEIs.

HEIs who are in a position to do so may seek to compensate for the loss of public funds through expansion of overseas students or research income, though presumably the latter will have to be sought from sources other than research councils (though this is likely to vary by subject area and could presumably only be secured at some additional cost). Here other funding sources may be able to *substitute* for a contraction in public funding. Presumably any such substitution is likely to be partial unless the process of contracting public funds stimulates an entrepreneurial spirit that would otherwise have remained dormant. In these circumstances our analysis based on a snapshot of average relationships, would prove overly pessimistic. However, there may be some

HEIs who are severely restricted in their ability to secure other sources of funding, and for whom public funds may even be *complementary* to their other funding sources. In this case a contraction in public funding may so constrain activity that other sources of funding diminish too, perhaps ultimately threatening the continued separate existence of the HEI. For such HEIs the impact of reductions in their public funding would be much more extensive than our multiplier analysis suggests. While our formal analysis reveals a considerable degree of heterogeneity among HEIs, we suspect even greater heterogeneity will be apparent in their reactions to the impending cuts in public funding.

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